

# Measles: Questions and Answers

## INFORMATION ABOUT THE DISEASE AND VACCINES

### What causes measles?

Measles is caused by a virus.

### How does measles spread?

Measles is spread from person to person through the air by infectious droplets. It is highly contagious.

### How long does it take to show signs of measles after being exposed?

On average, it takes 10–12 days (range 7–21 days) from exposure to the first symptom, which is usually fever. The measles rash doesn't usually appear until approximately 14 days after exposure, 3–5 days after the fever begins.

### What are the symptoms of measles?

Symptoms include fever, runny nose, cough, loss of appetite, watery red eyes, and a rash. The rash usually lasts 5–6 days and begins at the hairline, moves to the face and upper neck, and proceeds down the body.

### How serious is measles?

Measles can be a serious disease, with 30% of reported cases experiencing one or more complications. Death from measles occurs in 1 to 3 per 1,000 reported cases in the United States. Complications from measles are more common among very young people younger than 5 years or older than 20, and among pregnant people or those with weakened immune systems.

### What are possible complications from measles?

The most common complication of measles are ear infections (1 in 10 children) and diarrhea (fewer than 1 in 10 people). Pneumonia (1 in 20 children) is the most common cause of measles-related death. About 1 out of 1,000 cases will develop acute encephalitis, an inflammation of the brain. This serious complication can lead to permanent brain damage.

Measles during pregnancy increases the risk of premature labor, miscarriage, and low-birth-weight infants, although birth defects have not been linked to measles exposure.

Measles can be especially severe in persons with compromised immune systems. Measles is more severe in malnourished children, particularly those with vitamin A deficiency. In low-income countries, the fatality rate may be as high as 25%.

### How is measles diagnosed?

Measles is diagnosed by a combination of the patient's symptoms and by laboratory tests.

### Is there a treatment for measles?

There is no specific treatment for measles. People with measles need bedrest, fluids, and control of fever. Patients with complications may need treatment specific to their problem.

### How long is a person with measles contagious?

Measles is highly contagious and can be transmitted from 4 days before the rash becomes visible through 4 days after the rash appears.

### What should be done if someone is exposed to measles?

Notification of the exposure should be communicated to a doctor and the health department. If the person has not been vaccinated, measles vaccine may prevent disease if given within 72 hours of exposure. Immune globulin (a blood product containing antibodies to the measles virus) may prevent or lessen the severity of measles if given within 6 days of exposure.

### How common is measles in the United States?

Before the vaccine was licensed in 1963, there were an estimated 3–4 million cases each year. In the years following 1963, the number of measles cases dropped to 1,497 cases in 1983, the lowest annual total reported up to that time. By 2004, only 37 cases were reported. Subsequently, a record number of measles cases occurred in 2019 when 1,249 cases and 22 outbreaks were reported in the United States. A majority of the cases (85%) occurred in under-immunized, close-knit communities.

More recently, from January 1, 2020–March 28, 2024, CDC was notified of 338 confirmed measles

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cases in 30 jurisdictions; 98 (29%) of these cases occurred in the first quarter of 2024. Among the 338 cases, 309 (91%) were unvaccinated or had unknown vaccination status. Among 93 people diagnosed with measles in the U.S. as a result of exposure to the measles virus in another country, 63% were U.S. residents, 90% of whom were eligible for vaccination but were unvaccinated or their vaccination status was unknown. Clusters of unvaccinated people place communities at risk of large outbreaks, as was seen in Ohio in 2022, where 86 cases were identified, with 94% unvaccinated and 42% hospitalized.

For up-to-date case counts and outbreak information, visit CDC's Measles Cases and Outbreaks web page at [www.cdc.gov/measles/data-research/index.html](http://www.cdc.gov/measles/data-research/index.html).

### Can someone get measles more than once?

No.

### When did vaccines for measles, mumps, and rubella become available?

The first measles vaccines (an inactivated and a live virus product) became available in 1963, both of which were largely replaced by a further attenuated live virus vaccine that was licensed in 1968. The mumps vaccine first became available in 1967, followed by the rubella vaccine in 1969. These three vaccines were combined in 1971 to form the measles-mumps-rubella vaccine (MMRII by Merck). A vaccine that combines both MMRII and varicella (chickenpox) vaccines, known as MMRV, became available in 2005.

A second MMR (Priorix by GSK) was licensed and recommended in 2022. There is no difference in recommendations between Priorix and MMRII (Merck) brands of MMR. Priorix may be used in any situation where MMR vaccination is recommended. Despite minor differences in manufacturing (MMRII contains gelatin, Priorix does not), the two vaccines may be considered functionally identical and interchangeable.

Single antigen measles, mumps, and rubella vaccines are no longer available in the U.S.

### What kind of vaccine is it?

MMR contains live, attenuated (or weakened) strains of the measles, mumps, and rubella viruses.

### How is this vaccine given?

MMRII (Merck) is a shot that can be given subcutaneously (in the fatty layer of tissue under the skin) or intramuscularly in the deltoid muscle. Priorix (GSK) is only given subcutaneously.

### Who should get this vaccine?

All children, adolescents, and adults born in 1957 or later without a valid contraindication should have documentation of vaccination or other evidence of immunity. Additionally, some healthcare personnel who were born before 1957 may also need proof of vaccination or other evidence of immunity.

### What kind of "evidence of immunity" can substitute for MMR vaccination?

Evidence of immunity can be shown by having laboratory evidence of immunity to measles, mumps, and/or rubella or laboratory confirmation of disease. However, if a person doesn't have evidence of immunity to all three diseases (e.g., measles, mumps, and rubella), they would still need to get vaccinated with MMR since the vaccine is not available as a single antigen product in the U.S.

### At what age should the first dose of MMR be given?

The first dose of MMR should be given on or after the child's first birthday; the recommended age range is from 12–15 months. MMR can be given to children as young as 6 months of age who are at high risk of exposure, such as during international travel or a community outbreak. However, doses given before 12 months of age are not counted toward the 2-dose series for MMR. See MMR notes on the current CDC Child and Adolescent Immunization Schedule for details ([www.cdc.gov/vaccines/hcp/imz-schedules/child-adolescent-age.html](http://www.cdc.gov/vaccines/hcp/imz-schedules/child-adolescent-age.html)).

### When should children get the second MMR shot?

The second dose is usually given when the child is 4–6 years old, or before he or she enters kindergarten or first grade. However, the second dose can be given earlier as long as there has been an interval of at least 28 days since the first dose.

### How effective is this vaccine?

The first dose of MMR is 97% effective against rubella,

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93% against measles, and 78% against mumps. Two doses are 97% effective against measles and 88% effective against mumps. The second dose of MMR is intended to produce immunity in those who did not respond to the first dose, but a very small percentage of people may not be protected even after a second dose.

### Which adolescents and adults should receive the MMR vaccine?

All unvaccinated adolescents without a valid contraindication to the vaccine should have documentation of two doses of MMR. All adults born in or after 1957 should also have documentation of vaccination or other evidence of immunity.

Adults born before 1957 are likely to have had measles and/or mumps disease as a child and are generally (but not always) considered not to need vaccination.

### Which adults need two doses of MMR?

Certain adults are at higher risk of exposure to measles, mumps, and/or rubella and may need a second dose of MMR unless they have other evidence of immunity; this includes adults who

- are students in postsecondary educational institutions (for measles and mumps)
- are healthcare personnel (for measles and mumps)
- live in a community experiencing an outbreak or recently exposed to the disease (for measles and mumps)
- plan to travel internationally (for measles and mumps)
- received inactivated (killed) measles vaccine or measles vaccine of unknown type during 1963–1967. They should be revaccinated with two doses of MMR vaccine.
- were vaccinated before 1979 with either killed mumps vaccine or mumps vaccine of unknown type and are at high risk for mumps infection (e.g., persons who are working in a healthcare facility). They should be considered for revaccination with 2 doses of MMR.

### Why do healthcare personnel need vaccination or other evidence of immunity to measles, mumps, and rubella?

People who work in medical facilities are at much

higher risk for being exposed to disease than is the general population. Making sure that all employees are immune to these diseases protects both the employee and the patients with whom he or she may have contact. All people working in a healthcare facility in any capacity should have documentation of vaccination or evidence of immunity, including full- or part-time employees, medical or non-medical, paid or volunteer, students, and those with or without direct patient responsibilities.

Facilities should consider vaccinating with MMR vaccine healthcare personnel born before 1957 who lack laboratory evidence of measles, mumps, and rubella immunity or laboratory confirmation of previous disease. These facilities should vaccinate healthcare personnel with MMR during an outbreak of any of the diseases, regardless of birth year.

### Who recommends this vaccine?

The Centers for Disease Control and Prevention (CDC), the American Academy of Pediatrics (AAP), the American Academy of Family Physicians (AAFP), the American College of Obstetricians and Gynecologists, and the American College of Physicians (ACP) have all recommended this vaccine.

### How safe is this vaccine?

Hundreds of millions of doses of measles, mumps, and rubella vaccine prepared either as separate vaccines or as the combined MMR vaccine have been given in the United States, and its safety record is excellent.

### What side effects have been reported with this vaccine?

Fever is the most common side effect, occurring in 5%–15% of vaccine recipients. About 5% of people develop a mild rash. When they occur, fever and rash usually appear 7–12 days after vaccination. About 25% of adult women receiving MMR develop temporary joint pain, a symptom related to the rubella component of the combined vaccine. Joint pain only occurs in women who are not immune to rubella at the time of vaccination. MMR may cause thrombocytopenia (low platelet count) at the rate of about 1 case per 30,000–40,000 vaccinated people. Cases are almost always temporary and not life-threatening. More severe reactions, including allergic reactions, are rare.

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### **If a child develops a rash after getting the MMR vaccine, is he contagious?**

Transmission of the vaccine viruses does not occur from a vaccinated person, including those who develop a rash. No special precautions (e.g., exclusion from school or work) need be taken.

### **Who should NOT receive MMR?**

Anyone who had a severe allergic reaction (e.g., anaphylaxis) following the first dose of MMR should not receive a second dose. Anyone who had a severe allergic reaction to an MMR component (e.g., gelatin, neomycin in MMR II [Merck] brand) should not receive a vaccine containing that component.

As with all live virus vaccines, people known to be pregnant should not receive the MMR vaccine. Recipients capable of pregnancy should be counseled to avoid pregnancy for 4 weeks following vaccination. Those who are breast-feeding can be vaccinated. Children and other household contacts of pregnant people should be vaccinated according to the recommended schedule.

Severely immunocompromised people should not be given MMR. This includes people with conditions such as congenital immunodeficiency, AIDS, leukemia, lymphoma, generalized malignancy, and those receiving treatment for cancer with drugs, radiation, or large doses of corticosteroids. Household contacts of immunocompromised people should be vaccinated according to the recommended schedule.

Although people with AIDS or HIV infection with signs of serious immunosuppression should not be given MMR, people with HIV infection who do not have laboratory evidence of severe immunosuppression can and should be vaccinated against measles. For more information on who should not get MMR, including precautions, see [www.cdc.gov/vaccines/vpd/mmr/public/index.html#who-should-not-get-mmr](http://www.cdc.gov/vaccines/vpd/mmr/public/index.html#who-should-not-get-mmr).

### **Can individuals with egg allergy receive MMR?**

Yes. In the past it was believed that people who were allergic to eggs would be at risk of an allergic reaction from the vaccine because the vaccine is grown in tissue from chick embryos. However, studies have shown that this is not the case. Either brand of MMR may be given to egg-allergic individuals without prior testing or use of special precautions.

### **Does the MMR vaccine cause autism?**

No. There is no scientific evidence that any vaccine causes autism. The question about a possible link between MMR and autism has been extensively reviewed by independent groups of experts in the U.S. including the National Academy of Sciences' Institute of Medicine. These reviews have concluded that there is no association between MMR and autism.

For a summary of the issues on this topic, please read "Vaccines and Autism" on the website of the Vaccine Education Center at Children's Hospital of Philadelphia. This discussion can be accessed at [www.chop.edu/centers-programs/vaccine-education-center/vaccines-and-other-conditions/vaccines-autism.html](http://www.chop.edu/centers-programs/vaccine-education-center/vaccines-and-other-conditions/vaccines-autism.html)

The parent-led Autism Science Foundation offers an excellent literature review on their website at <https://autismsciencefoundation.org/autism-and-vaccines-read-the-science/>

For more information, visit CDC's "Autism and Vaccines" web page at [www.cdc.gov/vaccine-safety/about/autism.html](http://www.cdc.gov/vaccine-safety/about/autism.html).

### **Can the live virus in the vaccine cause measles, mumps, and/or rubella?**

Because the measles, mumps, and rubella viruses in the MMR vaccine are weak versions of the disease viruses, they may cause very mild symptoms of the disease they were designed to prevent.

### **What if someone who is pregnant inadvertently got the MMR vaccine?**

People are advised not to receive any live virus vaccine during pregnancy as a safety precaution based on the theoretical possibility of a live vaccine causing disease (e.g., rubella virus leading to congenital rubella syndrome [CRS]).

Because a number of people have inadvertently received this vaccine while pregnant or soon before conception, CDC has collected data about the outcomes of their births. From 1971–1989, no evidence of CRS occurred in the 324 infants born to 321 pregnant people who received rubella vaccine while pregnant and continued pregnancy to term. As any risk to the fetus from rubella vaccine appears to be extremely low or zero, individual counseling of women in this situation is recommended.